Climate Change and Canaveral National Seashore

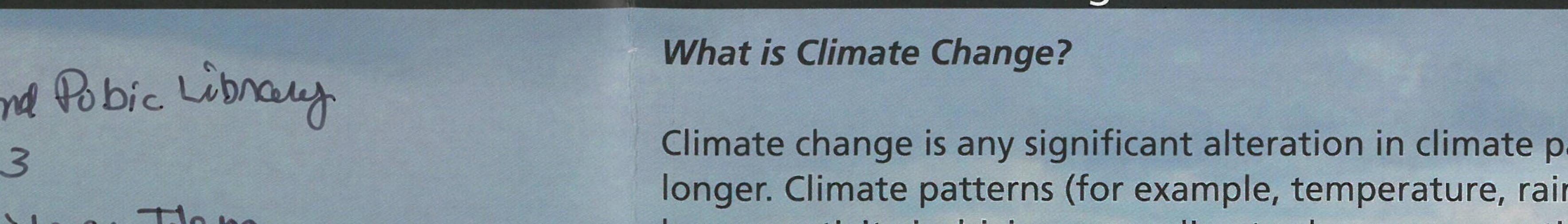
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National Park Service U.S. Department of the Interior

Southeast Archeological Center

Climate change is any significant alteration in climate patterns lasting for decades or longer. Climate patterns (for example, temperature, rain, sea level) vary naturally, and human activity is driving some climate changes—negative effects are already being felt within our national parks.



What are we doing to protect sites from Climate Change threats at Canaveral National Seashore?

Presently, scientists cannot predict with certainty the long-term impacts from climate change. However, the National Park Service has developed an adaptation strategy that focuses on identifying appropriate actions related to vulnerable cultural and natural resources before the threat from climate change becomes acute. In Canaveral National Seashore, the National Park Service's Southeast Archeological Center is working with scientific partners to identify those cultural resources most at risk and to determine appropriate courses of action. These actions include research, documentation, and protection measures.

Mound Stabilization

Several of the largest, most intact, and most significant prehistoric shell mounds in North America are located within Canaveral National Seashore. Shell mounds such as Turtle Mound, Castle Windy, and Seminole Rest were built over time by Native Americans piling up "midden" (discarded food remains such as oyster and clam shells). These large shell mounds served as foundations for structures and settlements, may have housed important leaders, and were likely key prehistoric monuments that later served as important navigational landmarks during the European exploration and colonization of the Americas. These nationally significant sites are much more than just giant "midden" piles—they hold important archeological information about the people who lived along Mosquito Lagoon for thousands of years. These data tell stories about how humans interacted with their environment, how climate change may have happened hundreds of years ago, and how people were able to adapt to these changes.

Unfortunately, sea level rise is already taking its toll on the many prehistoric shell mounds and middens within the park. For over 1000 years, beginning as early as AD 500, generations of Native Americans deposited oyster and clam shells, creating Turtle Mound, one of Florida's largest and best-known archeological sites. It is estimated to contain 1.5 million bushels of shells and towers close to 40 feet above the coastline's flat landscape. The southwest face of Turtle Mound is being lost to shoreline erosion due to storms, high water events, and boat wakes. This erosion will only intensify with increased storm frequency and sea level rise, known effects of climate change.

Multiple projects are underway to archeologically research, document, and protect Turtle Mound (and other mounds within the park), as well as to help conserve the natural shoreline habitat to create resiliency and a more stable environment to help fend off erosional threats. The park has partnered with multiple universities, non-profit organizations, and hundreds of volunteers in restoring native habitats and creating "living shorelines" by planting native vegetation and restoring oyster reefs. These actions restore natural shoreline communities, help to stabilize the substrate, and add a buffer of protection for mounds.



Artist view of Turtle Mound about 1000 AD. Courtesy of Martin Pate.



Courtesy of State Archives of Florida.

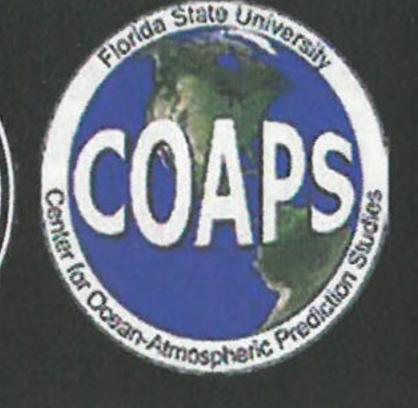


Scientists and community volunteers working to establish a "Living Shoreline" to protect mound sites in the Park. Courtesy of Margo Schwadron, NPS.

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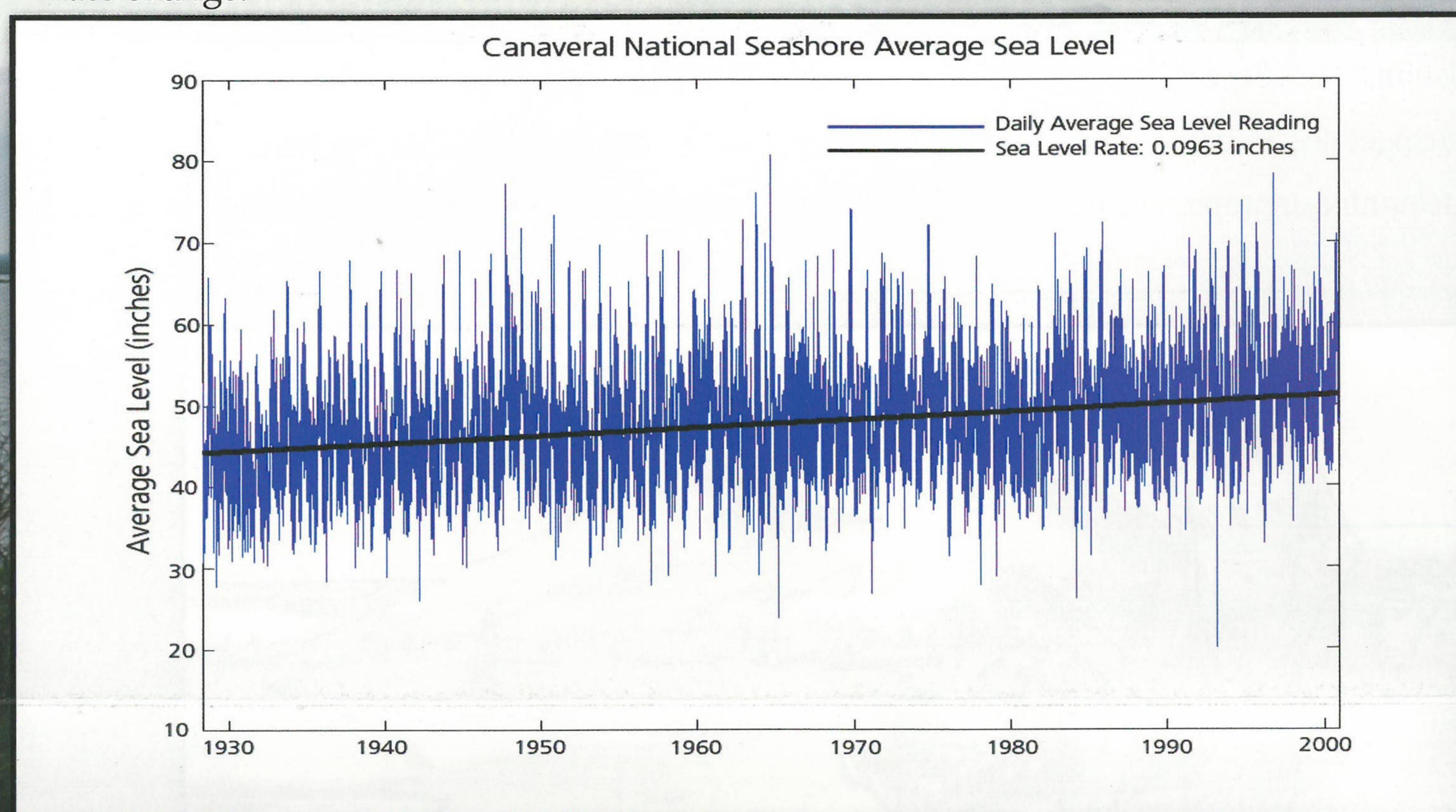






Climate Variability vs. Climate Change?

Climate variability is not the same as climate change. Climate variability is a temporary fluctuation observed in climate data resulting from normal climate cycles (such as El Niño) or irregular climate events (such as an unusually cold winter), whereas climate change is an actual alteration of the climate, also observed in the data. Climate cycles cause mean sea level to vary above and below its normal state (blue line)—an example of climate variability. The normal mean sea level (black line) is increasing near Canaveral—an example of climate change. The perception of climate change depends on the time period observed (for example, over a human lifetime, centuries, or geologic eras). An increase in sea level on a given day is not necessarily an indicator of climate change.



The chart above displays daily mean sea level readings (blue line) and the rate that mean sea level has risen (black line) near Canaveral National Seashore over the past 100 years. Courtesy of Marcus Johnson, COAPS.

What are Other Sources of Climate Data?

The climate at a given location is assessed using either direct observational or "proxy" data. Observational data rely on instruments (for example, thermometers for land and sea surface temperature, tide gauges for sea level) to record climate elements. "Proxy" data are obtained from biological sources (such as tree rings or coral growth) or geological sources (such as shoreline location). Observational data are rare prior to 1900, so proxy data are used to examine climate in the pre-colonial (pre-AD 1564) and colonial (AD 1564–1900) eras. Climatologists convert proxy data into equivalent data recorded by modern instruments (for example, by converting tree ring widths into inches of rainfall). The Center for Ocean-Atmospheric Prediction Studies (COAPS) at Florida State University analyzed both observational and proxy data for Canaveral National Seashore, allowing scientists to understand and determine how typical regional climate conditions are changing.

Archeologists are examining the ancient clams (proxy data) found within mounds and middens in the park for clues to past climate change. Coquina (*Donax variabilis*) are half-inch clams that burrow just under the surface of the sand at the edge of the surf to capture food brought by incoming or outgoing waves. This edible bivalve was collected by Native Americans, likely to make stews. Each tiny clam holds an oxygen and carbon isotope record for the time it lived, which scientists can use to calculate average sea surface temperatures for the periods that Native Americans collected, ate, and deposited the clams within the mounds. This ongoing study enables examination of changes in sea surface temperature over a 2400-year period.

Evidence for Climate Change in Canaveral National Seashore

The main indicators of climate change in the Canaveral region are hurricane frequency, air temperature, rainfall, and mean sea level. Annual hurricane frequency (but not necessarily intensity) appears to be increasing. Temperature and precipitation have varied in the region over the past 100 years, with no clear trend. Measurements from the past 100 years indicate mean sea level in the region has been increasing at a rate of 0.245 cm (0.0963 in) per year. A rise in mean sea level, coupled with the possibility of strong winds and storm surges associated with hurricanes, poses an increased erosion threat to Turtle Mound and the hundreds of low-lying shell middens and mounds in Canaveral National Seashore.



Eroding shell midden site, Canaveral National Seashore. Courtesy of Robert Hellmann, NPS.

